DIGITAL WORKPLACE EXCHANGE

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VIRTUAL THINK TANK **POST DISCUSSION REPORT**

Unlocking the potential of AI in the Energy industry through data

March 4th 2021

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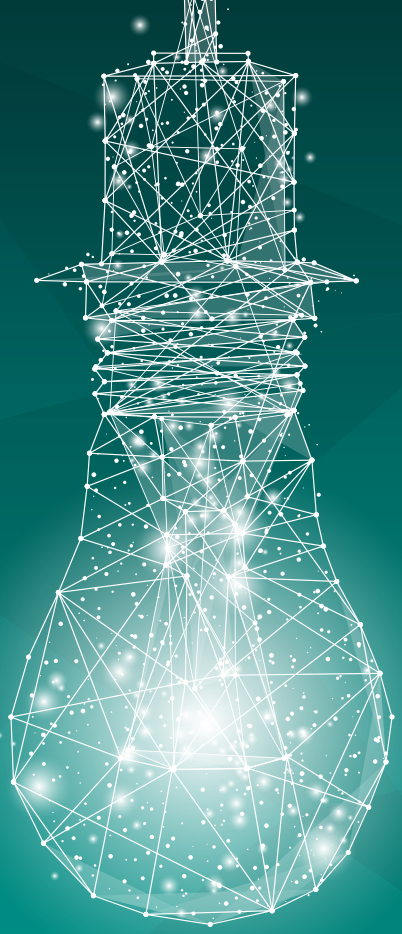
CONTENTS



"When people stop managing the hours in the office, and start managing the objectives of the team, the team will find their own process and change it up as necessary."

ALEXANDRE KOZLOV,
Director EMEA IT for Kelly Services

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INTRODUCTION

Dear readers,

We welcomed an intimate group of senior leaders from Shell, BP & Total, each responsible for driving digital transformation through data & AI to explore their primary challenges. This report will expand into how companies can speed up the development and adoption of new technology.

Big data and artificial intelligence play a leading role in improving safety, reducing maintenance and production costs or climate change analysis and are critical during the clean energy transition. The success of AI is completely dependent on access to large amounts of data that can be used to identify patterns, develop predictive insights, and enable increasingly accurate autonomous systems. But this data can be anywhere, is inherently dynamic, and often in multiple forms.

Data silos and technology complexity are the two biggest challenges to moving AI projects into production. NetApp can help you build your data fabric to overcome these challenges. A data fabric creates an integrated data pipeline across edge, core, and cloud. This streamlines the flow of data from ingestion and collection at the edge, to prep, training, and inference at the core, to analysis and tiering using the world's biggest clouds. By adopting artificial intelligence we can help you expand into new markets, optimize workflows, and deliver the latest innovations.

Read on to find more about the conversations that took place.

I hope you enjoy and find value in the findings.

MUNEER AHMAD
AI Solutions Architect
NetApp

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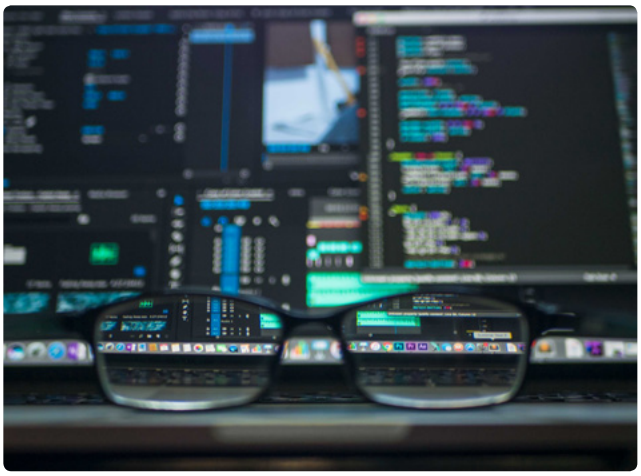
What are you hoping to achieve with AI and data analytics?

The group was asked what their goals were through the adoption of these new technologies, and what data & AI use cases were they seeing across the industry.

One of the new AI use-cases in the energy sector, remarked on by attendees, is enhancing quality assurance and defect detection where we have pipelines or machineries. Before deploying them companies are trying to work out where there might be some defects and whether there is an opportunity to automate.

The use case was based on the product and maintenance cost reduction of using robots as well as drones to get seismic images of pipes and refineries succumbing to wear and tear and corrosion over time. The use of imaging informed mine operators beforehand to avoid disasters and predict what to do right away. This process minimised the human risk, ensuring good quality data while optimising supply chain management by identifying the risk factors, avoiding delays.

A participant mentioned that Deep Learning is the best solution currently available. *"We can take images or real-time videos of those equipment's as well as the machines to figure out if there are any cracks or defects that might later on turn into a disaster"*. Currently this is happening manually, where experts are needed to figure out defects at risk of delaying the whole supply chain management.



This has resulted in not only cost-savings, but an ability to scale up and get quicker, more accurate and more predictive quality assurance done than you could ever have solely with humans. For them, the data is therefore assisting humans rather than replacing them. ***"We need humans as well but with this we are bringing a platform where they can focus only on the problems that matter a lot, because you might have a lot of machines, equipment and pipes that are being manufactured every day which as humans, we are limited on processing everything."***

Their platform focuses on whether there's a region of interest rather than going through all the data out there. *"For example, we have our machines across oceans, all in different locations and oil is flowing to them. There are temperature effects, humidity and other factors that are influencing the whole lifecycle of that. With the equipment's that we have out there, we are then figuring out if there is a way that machines like AI can help us to predict if there is some corrosion or erosion happening."*

Another participant agreed and followed with an example of their use case on solar assets and its sensitive procedures; where many of the operations can shut down systems resulting in stopping the whole data collection. This leading to a common occurrence on upper layer application levels having data outages, where data quality processes would need to be put in to place to fill in the gaps. *"**The key thing is ensuring the data path and the data quality is somehow fully ensured with no disruptions."*** The participant went on to discuss the scale of architecture which has to be designed with proper back-up systems during these forced outages to avoid gaps in the main data structure. The way in which this area was addressed was by working on the cloud.

Participants also discussed use-cases and new opportunities in oil and gas exploration, using robots for exploration as well as drones to gather seismic images, and other opportunities where the use of AI can minimise human risk. A lot of conditions, not only temperature and fumes, can prove to be lethal. AI ensures that quality data is gathered where we can get the information we need, which was not possible before.
One attendee explored how they are adding assistance

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with voice chatbots. "Operators need to keep their hands free as they are moving from one place to other places and voice-enabled chatbots can assist operators with questions and status reports as they move along here and there in a hands-free way while they are commuting and while they are communicating as the process was happening".

As a result across a complete lifecycle view, there are opportunities from explorations to maintenance, safety, quality to service and customer experience.

Today, there are hundreds of use cases across the businesses involved in today's discussion. Examples range from forecourts and retail all the way through to exploration, production and new energies, and some are making great progress in certain areas. However, with so many projects happening simultaneously, the associated challenges of implementation are becoming increasingly complex, and data is at the heart of it all.

One attendee shared their initial challenges with getting their data in the right place; *"We're still operating in some ways through document-based workflows and it's finding ways to move into centrally-accessible trusted data platforms that ingest and make data available for cloud-enabled apps to view and process information and save information and then once you have those data flows, which we've built in certain aspects of our business and are increasingly landing, then you have a whole load of analytics and AI opportunities with that data."*

The group agreed that there are different types of use cases, depending on what data frequency, volumes and trading data sets you can compile. *"There are things where if it's real-time streaming data to operations, then there's quite a lot you can do. We are seeing things like C3 and various different other approaches around exception-based and parameter technical monitoring where we would be under our initial stage of the high and low points that we're trying to keep equipment within set points to modelling out with machine learning. What we expect a particular piece of equipment to be operating like and what happens when we diverge from the operating parameters or model behaviours of the system that flags attention."*

Another area discussed was around machine vision where attendees have a variety of different imagery coming together; 3D photogrammetry, laser scanning, drones, helicopters and even people walking around with backpacks. "There are many opportunities to use imaging; you can set a base time and then qualify impact to equipment using machine vision... it can be simple things like dented equipment that may have had some sort of impact. It can be insulation damage, it can be corrosion and we can also integrate that with other things we're doing, like, for instance, with AXELOS, which is a Shell venture investment that is one of our portfolio companies where we can be doing reduced basis finite element modelling to understand whether the corrosion on structural elements is load-bearing or not and if it's a concern that we need to address." The group agreed that in order to enable a foundational data strategy, getting organised for your data to succeed with your infrastructure can flow into some very exciting use cases.

The breadth of what is possible is massive if you get your data and supporting infrastructure right. However, the real challenges for big oil majors isn't buying or using technology, but instead working in a way which enables continuous innovation. It is how they can work differently as an organisation and industry that is risk-averse, safety conscious, and largely still antiquated. All of those mindsets are contradictory to innovation.

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Attendees concluded that one of the ultimate goals they are looking to achieve through AI and Data is to create an environment where it's no longer about individual contributors and use-cases, but the collective knowledge that comes together in the right way to be able to solve these complex problems. Breaking away from standardised, procedural ways of working to create an ecosystem in which innovation can work in an effective way.

"When somebody talks about AI or people talk about automation, my view of seeing automation is the simplification, not to make it more complex, a simplified way of doing it. Looking for opportunities to leverage the power of technology to simplify the situation, get faster response at a lower cost"

Discussing challenges around streamlining your data to transform your organisational activity

The group shared ideas on volume, velocity and quality of data and went on to discuss some of the challenges which were critical in terms of identifying and capturing that data.

CHALLENGE ONE

Data needs to be right

The group decided that the first priority is that the **data needs to be right,** and that is where people are currently not dedicating enough time.

It's all about gathering the data. One participant exclaimed ***"We need to work very hard to get all the information at the beginning right. The technology is there. We can communicate it from one place to another. We can take a tablet. We can have these lenses, you can have this augmented reality but for me it's getting the data right. If we don't get the data right at the beginning, it's pointless."***

The group agreed that you can't just collect random data and hope for the best, it's about knowing what data you need. It's one thing to have data and to have information and it's an entirely different thing to have insight. Once you've got the right data collected you need to establish how that is providing you actual actionable insights?

"We are awash in data. There's plenty of data all over the place. The ways we manage it is still basically a computer version of 1950s. It hasn't really gone that far. So, getting into these essential data platforms where data finds its way there via an open restful API and we have enterprise data models in place and reference data, that we can put things into place, that's really critical."

The enterprises represented today have a lot of data available, and they can readily get some information out of it, but that data also contains some hidden gems. "We can get a lot of information out of that but what we don't know is how to access it. We don't, in fact, know if it exists because it's somewhere in the mess of our data". Transformation is needed for getting to the data link concept where you can have structured, as well as unstructured, data deriving actionable insights.

You may be missing lots of opportunity because you don't necessarily know what you can do with the data.

"When you're working with petabytes of data a day there are technologies that will help that journey but there isn't any AI magic pixie dust that one sprinkles on *this and so on the one hand you've got innovation where you're talking about people being able to experiment, try ideas out, play with the data, which I think some of these technologies can unlock, and we have lots of that. But, on the other hand, there is getting the right people in the room to discuss the challenges and the problems we're solving in the right way and for me the needle is more on the left side of the equation, than the technology side on the right. "*

It's one thing to say if you can get all the data and what you can do with it but it's entirely different to organise your enterprise and how you're operating to enable the the collaborative structures in place you need to take advantage.

One attendee added *"It's bringing those practices together in the right way that is important. My view is that in the same way that* ***AI is touted as the new revolution, agile is touted as the new revolution. It's all hyperbole in many ways because the thing is about how are we working together to solve a new range of problems*** *that when you look at them, by looking at them you change them. By experimenting you change the problem."*

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Ultimately the group agreed that it's the people aspect and getting those people to collaborate together the right way so that you can get the final output. It requires education too. You've got people that may not have the same view of technology as a technical person or a data scientist and you're trying now to capture things in a different way to provide value for them.

Enterprises must focus on Data IQ or AI IQ and communicate openly on the general level of data literacy within the organisation, because without this, it's very difficult to collaborate.

CHALLENGE TWO

The Right Data for Your Use-Case

A participant followed by discussing the challenges of capturing data and balancing it with the value proposition. They used the example of trading in supply for downstream value cases based on the scale of data, pulling operational data in, where it can be bespoke in some cases, to particular silos of the business. This challenge was deemed project-dependent but not necessarily a data priority for the whole enterprise. ***"When you get into those types of scenarios, it's challenging to make the investment case for new technology, that's very silo-specific."*** It is in using that data in a scalable manner that can not only provide benefit to the silo but provide benefit to the enterprise.

As with many enterprises, participants shared their opinions on every pocket of their organisation having their own favourite type of analytics and reporting tool per silo and the value that could provide. They reached a consensus on finding tremendous value in harnessing that data across the enterprise, through systems that speak the same language and looking upstream and downstream at the data. To be the first business group to push a use-case can be challenging and that's where those disconnects are most likely to happen between functional silo use cases versus enterprise business cases.

"We engineer our businesses to give a small set of data we think is useful but actually these days AI engines can consume as much as you can give it." Participant's agreed on the need for more data and more quality data readily available to unearth more knowledge enabling them to make valued and ground-breaking decisions.

One example shared by an attendee explored the IoT perspective on how they can collect more data about corrosion, which may not be necessary at the project design stage but when they put temperature sensors over parts of the plant, along distillation columns, and reactors, they need to actually understand what's happening much better than having a simple input and output sensor.

The same applied to another participant who expanded the discussion to all other sensor types, but particularly quality sensors, which tend to be in short supply on providing information on their facilities. They went on to discuss how they can collect a lot more data at a really low cost as part of pushing into the IoT world. ***"Sensors that are lick and stick send the data straight to the cloud, just getting large quantities of data to the cloud is a challenge."*** When they look at their traditional businesses and traditional technologies across so many silos and use cases, just trying to take terabytes of data up into the cloud wasn't easy.

The group noted when you are working on a small project, identify the key objectives and go after them, deliver some quick benefits that you can demonstrate, and show that you can make a difference. But attendees mentioned that when they then try to operationalise it, they have all sorts of other challenges around keeping

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things consistent. ***"Scaling across companies as big as Shell and BP becomes a big challenge because there are different approaches, different silos, and different cultures across large companies."*** Trying to get that right now in terms of its reorganisation and having more of a consistent approach across the organisation being more centrally driven. ***"Scaling successful pilots is the biggest challenge that I've seen and that's where the value comes."***

Examples included corrosion monitoring, inspection data points on the next generation of visual analytics, that can be applied to visual, infrared and acoustic information. Discovering more about your facilities than you could from the basic sensor pack that you've used in the past, and then interpreting that data and its scale without human involvement is a big challenge. ***"There's only value in today's organisations if we can automate it end-to-end"*** where decisions are kicked out and actionable data is fed to a human.

The participants went on to deliberate how they can get to the state where they can kick out reliably actionable information from these systems as opposed to previously when they would have had a lot of false alerts, false positives and false negatives. ***"Start small and then expand as you improve on the value seems to work."*** In particular with remote sensors and the data gathering. One participant quoted the Director of Research at Google, saying, ***"...it's not about the quality of the algorithms, it's the amount of data we have"*** as a starting point.

The participant went on to raise an example within their solar business. They discussed the challenge of collecting more temperature information from devices, cables, and with all this information, trying to create predictive models in order to let them know whether a device needs to be replaced after a certain number of operational hours. By doing this temperature analysis, they can't prevent any kind of failure or do local thermography through operators. The challenge was the large amount of sensor devices to connect everything that they considered important.

The other roadblock was how to connect the various communication paths in order to move the information into the cloud for analysis, when they need a large amount of data to create a proper model. The group agreed on this being the most challenging part. One of the keys points raised was that current tools are not ready to manage this high volume of data.

Once again the group agreed that it is about protecting the ***"quality of data, of a specific set of rules, or a specific set of sensors or specific set of answers are of a good quality, and then once those are addressed, we can expand in other areas."*** It's about the data you select to receive, what you want to do with it and how you want to analyse it.

When implementing AI projects in silos, the group discussed who is best to make decisions on data; with a pragmatic approach it came down to embarking on the AI space by initially starting with the pain point. ***"Either it's manual or repetitive work or something where we see there's value but maybe we don't have an answer."*** Trying to attach it to a real problem where most likely the first POC case will be either something that costs money they want to save or something related to the business where it's repetitive or a problem where they have made mistakes they would like to address. The approach taken was once they have proved that case,

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they can expand in other areas making it a real use case with a specific outcome. ***"AI is perfectly suited to improve your efficiency or to lower down cost or both. You'll have to be very selective where you apply it."***

The group built up examples of the use cases on a smaller scale perspective but with a view to scale, and discussed how they might roll out to wider regions or different global markets. For example, when looking at analysing lease/crude bid packages, in whatever region it may be, there's volumes and volumes of information you have to go through in order to look at the economics of that raw commodity cost and determine a price point, based on what the curves are, the types of deals that should be done etc. Being able to aggregate that data and spit out models and make that decision much more quickly can help drive competitiveness.

"There is lot about sensors, gathering data. We are moving more towards the vendor service model and there's great solutions out there that can help pick up that data, use that data, but in a lot of cases the vendor solutions only get 60% or 70% of the way of where we want to go."

One participant raised their view on augmenting vendor solutions, not necessarily with customisation but by adding sensors to get additional data sets. Such as; rail optimisation, fork logistics or another TMS system, where it already has a lot of track and trace information but not necessarily granular enough. It is going through gates with an eight or 12 hour window, and locating specifically where that rail car is to be able to optimise the fleet. Getting these sorts of projects moving, finding that you're having to augment and take off the shelf solutions and then putting bespoke aspects around it to get to where you want to be from a value capture perspective.

CHALLENGE THREE

People and Capabilities

There has been a proliferation of technologies, of capabilities, of opportunities, and all this change when not managed correctly is overwhelming for employees. Attendees are still struggling to figure out the right approach for change management in all of that. Across the board there is so much innovation happening that it can be tough to manage such extensive transformation.

The battle is how to keep the pace of innovation up, whilst having a change management strategy built for scale. Building some sort of coherent centre of excellence for how to use insights and accelerating citizen developer opportunities across the enterprise. Getting the right information to the right people in the right platforms at the right time is very important. ***"How can you account for the knowledge of the engineer or employee that's looking at it? How do you get that into the programme?"***

The group again came to the conclusion that it's not about having the best toys, it's about ***getting the right people together.***

"The core challenge is not some magical technology that's suddenly going to make this problem go away. I think ***it's about managing the structure and the matrix of the organisation so that the right people talk critically at the right time.*** *We are talking about in 80,000-plus people organisation. You're talking about something that has been traditionally very difficult to do. It's less difficult now but for example, the design of our organisation is based on getting oil out of the ground, which requires a heavily proceduralised, well-defined engineering mindset. AI is not like that. It's very much in the complex space. If you apply all our standardised ways of working, which are some of the best in the world, they do not work in this complex domain and I think that's what you're getting, a bit of a cross-section of here where you've got operational people with problems worth solving, you've got CI experts, you've got agile experts, you've got lean practitioners but joining the dots between those disciplines to unlock those conversations for me is the AI challenge. For me it's not technology but I'm biased. It is hard to adapt a culture to that."*

It's not just getting engineers and employees engaged in change that is a challenge. It's very difficult to get the resources within organisations to accomplish their multi-year roadmaps. One attendee summed up his experience *"I've been working in this oil and gas industry for a while and if they want something, they want it now. If you explain today, well, this process is*

Virtual Think Tank Highlights

going to take two years, after two years we're going to get the benefits, hopefully we'll get better with time, they say, no, I want it now." Several of our group had experienced similar roadblocks.

It takes time to put everything together. The group agreed that trying to convince senior management that we need to put the effort in and, it will take a few years but at the end you can save a lot of money, is still difficult despite the clear benefits of AI & Data Analytics. Convincing your organisation to put the money, to put the resources where the future could be very bright bringing in cost-cutting and forward maintenance. How do you get that buy-in and understanding before the buy-in from your leadership?

CHALLENGE FOUR

Working with vendors

Over the course of the discussion, we heard some great success stories of ***point solutions and augmenting vendor solutions.*** With so much change happening quickly across the world, point solutions have given people the chance they need to gain traction quickly to seize on an opportunity in front of them and help gain the mid-to long-term support they require.

Leaders explained how through setting up Digital Center of Excellences, they are able to unlock AI in the services to solve real business problems. *"We've been going on this journey for three years now in terms of digital technology and we're now at a point where we are showing quite consistently how we can operationalise this technology, because we can come up with these very clever AI solutions but they then have to be moved into an operational environment that by its very nature needs to be incredibly robust."*

You need to get your organisational infrastructure and data fluency at a point where you can easily articulate the opportunities and benefits to the stakeholders and educate them in innovation to say, well, you might get nothing back. *"We might spend half of it and say stop but actually we'd like to think a lot of this is low-hanging fruit we are missing out on."*

Making strides to create what amounts to some early wins that hopefully can get some significant awareness built in about what it really takes for AI to succeed.

It's often a struggle to get the traction for the continued commitment over time to build capability and competency and collaboration. *"There's no silver bullet. Like it's not one solution that comes in and fixes everything, however a combination of Point Solutions that can work together can help you build support through quick wins."*

Participants went on to discuss vendor analysis, working with some of the leaders in the field and having to adjust their solutions making them more bespoke and the associated challenges of having ***"pockets of bespoke data."*** When discussing scalability, leveraging that data at the enterprise level, the challenge was trying to fit that into other systems and use cases. It was agreed that both systems can learn from each other.

Today, vendors are providing solutions not only particular to one company for one particular use case but they are taking into consideration a lot of use cases at a time, and in turn all parties are starting to improve. In effect you develop the capabilities with them, helping them improve their product.

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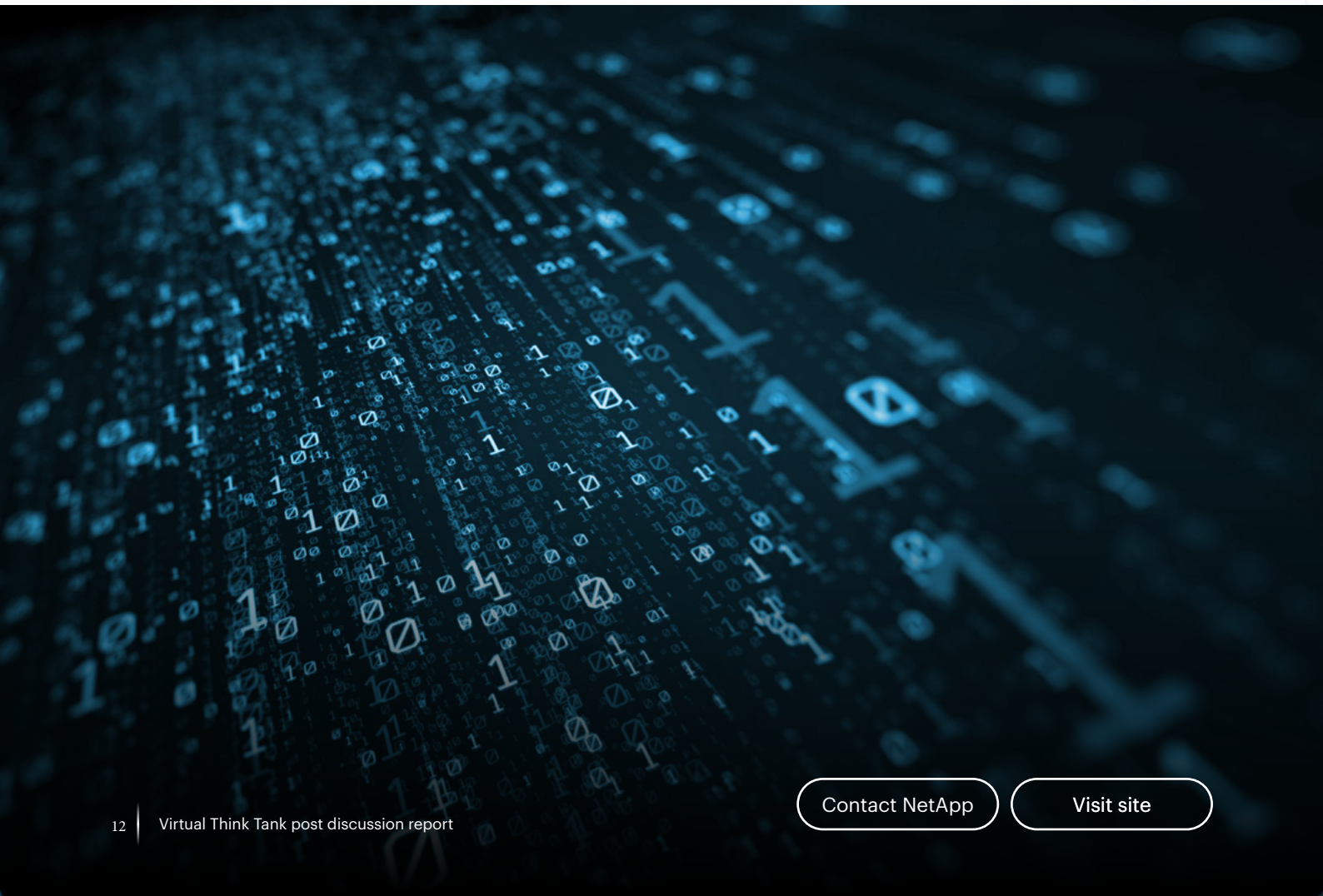
"It's almost an AI software as a service and then it's the other tier where you buy an AI platform and build the capability with them on a platform but you own the algorithms yourselves but at the same time, you have to build everything from scratch whereas the AI as a service you might be able to buy set of standards that other suppliers are offering where you add the bespoke additional extensions. Whereas the other ones you might have to build your own. It's a strategic choice that a company has to make."

The group were then asked whether they should give their data to third parties or start building that data themselves. One participant responded by saying it is more expensive building your own data, but justified it by saying that in the digital world it is starting to become a differentiator.

"It is the mind-set that we need to explain to the business and say, outsourcing it through the XYZ partners is a strategic choice but at the same time, you're giving them all your crown jewels in place of your knowledge and IP that in effect you are helping them build the Google of your industry."

One attendee thought of this being a very interesting contract negotiation point where it comes down to IP, data and ownership; before you can agree to move forward. In the market people start POCs together with vendors that provide a solution to a particular problem. If you have a lot of data out there, then your IP changes. Your IP then becomes your data rather than your own algorithm and at that point it's important to have your own AI platform so that you can utilise all the data and own that utilisation. The participant then discussed how you can update algorithms as you evolve, whereas you are time dependent on infrastructure, and on capabilities of scalability.

If you own data you've already proved your ideas, it's therefore time to scale up. At that time it's really important to understand the scalability factor itself from the data. If you are able to do number-crunching of 1 GB of data within an hour, that's okay because it is a small amount of data. However, if it goes to terabytes and petabyte scale later, there's going to be a bottleneck. The data bottleneck is fetching it out and maintaining the quality each and every time it updates that data.



Virtual Think Tank Highlights

It starts from silos where each department is a data owner. You see multiple departments working on similar kinds of data but they are not able to share that information. You are creating that data again and again in a similar fashion, not only wasting time but also resources. With a platform that can identify duplication and compaction, you can invest in ideas, prototyping and development. To sum up, this paves the way to move towards the cloud, because computing instruments are not always effective. To link that gap from on-prem, or from the edge device going to the cloud, doing that processing and getting that data back, you don't want the hosting costs associated with the cloud which might be an investment.

"You could do it in the cloud, you could also do it with a big AI engine but you need that sub-second responsiveness. The data passes out of the IoT device into some pre-trained model and the outputs and the outcomes are implemented. That responsiveness, you see a setting change and that needs to happen in a sub second, sub minute frequency."

In conclusion

In closing thoughts from the group, attendees agreed that in part they are still working with technology and data flows that sometimes feel like they're 1950s in design. Slowly, they are getting the data where it needs to be. Ultimately this is about people; how can we organise for success, leverage collaboration and discover a different way of working to truly create a case for change that will gain traction with leadership. Within this, it is paramount to gain understanding that while securing resources is going to take time, the investments need to be made - not just in point solutions but also strategies for energy in our companies that allow us to help, today, on site.

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